INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

28 April 2011 (pm)

Subject ST9 — Enterprise Risk Management Specialist Technical

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*
2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*
3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*
4. *Mark allocations are shown in brackets.*
5. *Attempt all nine questions, beginning your answer to each question on a separate sheet.*
6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 BigBank plc primarily offers loans and mortgages. Its front office focuses on revenue maximisation, while the risk management function focuses on loss minimisation.

(i) Outline the advantages and disadvantages of organising the functions of the bank in this way. [3]

(ii) Discuss two alternative ways of organising the functions of the bank, including the advantages and disadvantages of each. [11]
[Total 14]

2 XYZ Limited is an international conglomerate.

(i) Describe the advantages to a group such as XYZ of actively managing its portfolio of risks. [4]

XYZ's risk management framework includes the following components:

(a) risk capacity
(b) risk profile
(c) risk tolerance
(d) risk limits
(e) risk appetite

(ii) Discuss aspects of each of the above components that will be relatively more difficult to manage as a consequence of XYZ being an international conglomerate. [6]
[Total 10]

3 A model has been developed for a financial time series.

(i) Describe the construction of a QQ plot to judge the goodness of fit of the model. [3]

(ii) Explain how to interpret a QQ plot. [3]

(iii) State two other graphical diagnostic tests that could be used to judge the goodness of fit of the model. [1]

The diagnostic tests reveal that there are two data point outliers in the twenty sampled data points used to fit the model. It has been suggested that the model would be improved if it were to be re-parameterised after excluding the two outliers from the data.

(iv) Discuss this suggested approach. [2]
[Total 9]

4 ABC is a fund that invests entirely in corporate bonds. For many years the fund manager has included a default loss probability distribution for the fund in its quarterly financial statement. The fund manager produces the distribution from the estimated probability of default and estimated loss given that a default has occurred (loss given default) underlying each bond's credit rating. The credit ratings, probability of default table and loss given default table are all provided by rating agencies from time to time.

Each bond's probability of default is assumed to be independent from that of the others.

(i) Describe the shortcomings of this approach. [3]

A corporate bond is likely to default when the share price falls to zero or perhaps near to zero.

(ii) Discuss how this insight could be used to develop an alternative approach based on share price movements. [4]
[Total 7]

5 DEF Insurance is a long established multinational general insurance company selling a range of personal lines products in a number of developed and emerging markets across the world. The company's well known brand is a key competitive advantage. In each territory a wholly owned subsidiary is used to write and administer the business. Each subsidiary is separately capitalised and regulated.

DEF targets a strong ERM classification from Standard & Poor's.

(i) Outline the requirements that this imposes on management. [2]

DEF has a target level of group economic capital.

(ii) Describe the main implications of the group structure for this economic capital calculation. [4]

The Board recognises that damage to the DEF brand in one territory could damage the brand in other territories.

(iii) Outline the ways in which this risk could be incorporated into the economic capital setting process. [4]
[Total 10]

6 Country X is a large free market economy with a sophisticated financial system. More than 3,000 stocks are listed on the main stock exchange. For the past several years the main stock exchange has required that all listed companies publish risk reports as a part of their quarterly financial statements.

(i) Describe the likely content of such a risk report. [6]

An equity analyst plans to construct a new risk measure using the information contained in the risk reports and financial statements. Its purpose is to produce risk-adjusted returns for all of the companies listed on the main stock exchange on a quarterly basis.

(ii) Explain how this risk measure could be constructed, including the information that would be used. [9]
[Total 15]

7 You are modelling the returns on a portfolio of ten high-yield corporate bonds. Your definition of default is that the return in any one year is less than minus 60%. The probability that a single bond will default is 10%. You believe that the returns on the bonds are linked by a Gumbel copula, with a single parameter $\alpha = 2$.

The generator function for the Gumbel copula is $(-\ln F(x))^{\alpha}$.

(i) Calculate the probability that all ten bonds will have defaulted in one year's time. [3]

(ii) Explain the relevance of the correlation coefficient and the choice of copula when considering the relationship between two or more variables. [2]

(iii) Discuss the choice of the Gumbel copula in this case. [4]
[Total 9]

8 A life insurance company that will be subject to Solvency II is considering the following proposals for controlling excessive mortality risk within its term assurance portfolio:

- an excess of loss reinsurance treaty
- a mortality catastrophe bond

The excess of loss reinsurance involves payment of a premium. In return, the insurance company will receive payments if aggregate death claims in a single year exceed a certain level.

The mortality catastrophe bond would be structured as a collateralised debt obligation (CDO), with aggregate losses up to a specified limit being covered by the structure.

(i) Explain how such a CDO might be structured. [6]

(ii) Discuss the advantages and disadvantages of the two approaches. [8]
[Total 14]

9 Scilly Sandals plc makes sandals, flip flops and other seasonal footwear. It is experiencing severe liquidity pressures.

Discuss the options available to the company that may be utilised to help ease these pressures. [12]

END OF PAPER